Claims:

1. A fuel cell system, comprising:

a fuel cell having an anode and a cathode;

a fuel gas supply module that supplies a fuel gas containing hydrogen and a hydrocarbon compound to the anode; and

an oxidizing gas supply module that supplies an oxidizing gas to the cathode,

wherein the anode of the fuel cell have a catalyst supported thereon for causing an endothermic reaction of the hydrocarbon compound.

2. A fuel cell system in accordance with claim 1, wherein the fuel gas supply module comprises:

a reformer unit that generates hydrogen through a reforming reaction of a selected material; and

a reform control unit that controls operation of the reformer unit to generate the hydrocarbon compound with hydrogen.

3. A fuel cell system in accordance with claim 2, wherein the hydrocarbon compound is methane.

4. A fuel cell system in accordance with claim 3, wherein the catalyst is a methane reforming catalyst including at least one of Ni, Rh, Ru, and their alloys.

5. A fuel cell system in accordance with any one of claims 2 through 4, said fuel cell system further comprising:

a supply unit that supplies oxygen and steam to the reformer unit,

wherein the reform control unit controls the operation of the reformer unit to cause a partial oxidation reaction of the selected material with the supplied oxygen for production of hydrogen to proceed in parallel with steam reforming reaction of the selected material with the supplied steam for production of hydrogen.

6. A fuel cell system in accordance with any one of claims 2 through 5, said fuel cell system further comprising:

a temperature control unit that controls an operation temperature of the fuel cell to a preset target temperature to regulate an amount of heat generated by the reaction in the fuel cell.

7. A fuel cell system in accordance with claim 6, wherein the temperature control unit controls internal temperature of the reformer unit to make a difference between the internal temperature of the reformer unit and the operation temperature of the fuel cell within a preset range.

8. A fuel cell system in accordance with any one of claims 1 through 7, wherein the reaction proceeding in the fuel cell is a heat-involved reversible reaction.

9. A fuel cell system in accordance with any one of claims 1 through 8, wherein the fuel cell has an electrolyte membrane placed between the anode and the cathode, and

the electrolyte membrane includes:

a base layer mainly composed of a dense hydrogen permeable material; and

an inorganic electrolyte layer formed on at least one face of the base layer.

10. A fuel cell system in accordance with any one of claims 1 through 8, wherein the fuel cell has an electrolyte membrane placed between the anode and the cathode, and

the electrolyte membrane includes:

a water-containing electrolyte layer having a water content; and

dense film layers of a hydrogen permeable material formed on both faces of the electrolyte layer.

11. A control method of controlling operation of a fuel cell system, said fuel cell system comprising: a fuel cell having a catalyst supported on an anode side for causing an endothermic reaction of a hydrocarbon compound; a fuel gas supply module that supplies a fuel gas containing hydrogen and the hydrocarbon compound to anode of the fuel cell; and an oxidizing gas supply module that supplies an oxidizing gas to cathode of the fuel cell,

said control method comprising the steps of:

setting a target temperature in operation of the fuel cell; and

controlling an operation temperature of the fuel cell to the target temperature to regulate an amount of heat produced by a reaction in the fuel cell.